EDCI 3500 – Knowing and Learning in Mathematics, Science, and Computer Science

Instructor Information

Name: Ms. Nancy Joykutty
Pronouns: she, her, hers
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Phone Number: 940-565-3351 – It is best to contact me via email or unless previously discussed.
Office Hours: Tuesday/Thursday 9:30-11:00 am & Wednesday 11:30-1:00 pm or by appointment
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Fall 2025 Sections:

EDCI 3500 – 001 – Section 1 – Tuesday & Thursday 11:00 - 12:20 pm
Curry Hall Room 323

Course Description, Structure, Objectives, Expectations and Norms

Course Description

Knowing and Learning in Mathematics, Science, and Computer Science. 3 hours. Psychological foundations of learning. Problem solving in mathematics, science, and computer science education including utilizing technology. Principles of expertise and novice understanding of subject matter. Implications of high stakes testing. Foundations of formative and summative assessment.

This course provides students in the Teach North Texas program the opportunity to examine critically the political, ethical, and educational policies influencing knowing and learning in mathematics and science in the American educational system. Students in this class will examine the historical and current understanding of procedural and conceptual understanding, assessment, learning theories (e.g., behaviorism, cognitive, and social perspectives), and issues of access and equity in the classroom. This course introduces the ways an in-depth understanding of how people know and learn can be used to help make the teaching and learning of mathematics and science more effective.

This course will provide students with the opportunity to:

- identify a variety of learning theories and employ these theories to guide their own practice
- provide learners with a contextual understanding of the development of school practices and methods, including the implications of educating learners who are racially, linguistically, and culturally diverse
- develop the knowledge, dispositions, and skills needed to be effective teachers in middle and high schools.

Course Structure

The course will be conducted in a face-to-face format, twice a week for 80 minutes in Curry 323These classes will be interactive and will include a significant amount of discussion among your classmates regarding the various readings & articles.

Course Prerequisites or Other Restrictions

Prerequisite(s): Admission to the Teach North Texas program, a University grade point average of at least 2.50, and TNTX 1100 (may be taken concurrently) or consent of a Texas North Texas adviser in the College of Science.

Course Objectives

After completing the required readings and participating in class activities, the prospective mathematics or science educator will be able to do the following:

1. Articulate various standards (e.g., TEKS, Common Core State Standards) that are critical to the knowing and learning of science and mathematics.
2. Explain the role of these various standards documents in the assessment process as they relate both to in-class and standardized testing.
3. Describe the various theories used to explain mathematical and scientific knowing and learning and apply these approaches to structure classroom practice.
4. Express informed opinions on current issues and tensions in education, especially as they relate to mathematics and science instruction.
5. Students will learn how to systematically analyze human social conditions in educational settings (e.g., individuals, groups, communities and cultures). In particular, students will learn to observe, theorize, model, experiment and/or interpret as a means of inquiring into human social relations.
6. Students will demonstrate understanding of ethical principles in education, and ethical outcomes of education relating to mathematics and science.

Course Expectations & Norms

This space intentionally left blank until the conclusion of the first week of class.

Communication Expectations

This course meets in-person, which means you are expected to arrive in person for all classes either before class begins or on time. As personal concerns or questions arise, contact Ms. Joykutty using the UNT email system.

- ***UNT email is the preferred form of communication.*** It is my intent to reply to all emails within 24 hours. If you don't hear back from me by that time, please feel free to send me a reminder.
- **Attendance** - If you are going to be absent from class email me (nancy.joykutty@unt.edu) **before class begins**. Attendance **DOES** count in EDCI 3500 and is explained in detail later in the syllabus.
- **Canvas & Announcements** - All class announcements, readings, handouts, slides, assignments, and information will be available in Canvas.
- **Online Communication Tips** - The following link Online Communication Tips (https://clear.unt.edu/online-communication-tips) provides some excellent online communication guidelines recommended by UNT. They cover general electronic communications, use of email, and Discussion Board communications. In general:
    1. Be professional
    2. Be proactive
    3. Be respectful
    4. Be kind

Teaching Philosophy

There are three primary tenets to my Teaching Philosophy. I will strive to demonstrate and model these beliefs both inside and outside of the classroom. These are:

1) **All students can Excel** - Every student can learn & flourish given the appropriate opportunities, support, accommodations, and encouragement.
2) **Active Learning** - Students learn best by promoting inquiry and curiosity as well as actively being part of the learning process. I view my role primarily as a facilitator. We will spend a significant portion of our class time "doing and discussing" rather than "reading and listening."
3) **Relationships** – Relationships are a key enabler for effective student learning. Active listening is foundational to better relationships. ***All voices are important!*** I want to hear my students' voices, thoughts, and opinions. In order to facilitate this, we will utilize the following pedagogy tools in class:

    - **Equity cards** – We will use equity cards to give every student a chance to participate in class.
    - **Various feedback mechanisms** – Students will be given several options to ask questions or seek feedback.
    - **"Open door" policy** – I will have weekly scheduled office hours and additional office hours available by appointment. I have an open door policy where if you see me in my office you are more than welcome to come in and talk to me and I will listen to you without judging.

Required/Recommended Materials

Depending on supplies, the required text is available by checkout for your Knowing & Learning semester.

> Hammond, Z., & Jackson, Y. (2015). *Culturally responsive teaching and the brain: promoting authentic engagement and rigor among culturally and linguistically diverse students*. Corwin, a SAGE company.

Additional readings, handouts, and slides will be made available during the semester via Canvas.

As the course has digital components, the student will need access to the following (at a minimum):

- Reliable internet service for access to Canvas and various other technology sites.
- UNT EagleConnect, familiarity with the official university email is crucial as it will be the main source of communication.

Skills Related to TExES Pedagogy and Professional Responsibilities (PPR) EC-12 (170)

Domain I: Designing Instruction and Assessment to Promote Student Learning

Competency 001: The teacher understands human developmental processes and applies this knowledge to plan instruction and ongoing assessment that motivate students and are responsive to their developmental characteristics and needs.

Competency 002: The teacher understands student diversity and knows how to plan learning experiences and design assessments that are responsive to differences among students and that promote all students' learning.

Competency 004: The teacher understands learning processes and factors that impact student learning and demonstrates this knowledge by planning effective, engaging instruction and appropriate assessments.

Domain II: Creating a Positive, Productive Classroom Environment

Competency 006: The teacher understands strategies for creating an organized and productive learning environment and for managing student behavior.

Domain III: Implementing Effective, Responsive Instruction and Assessment

Competency 008: The teacher provides appropriate instruction that actively engages students in the learning process.

For a complete description of standards and competencies, visit the ETS TExES Tests At A Glance test preparation resource, located at: https://www.tx.nesinc.com/Content/Docs/160PrepManual.pdf

NSTA Standards

The National Science Teacher Association (NSTA, 2012) *Standards for Science Teacher Preparation: Pre-Service Science Standards* addressed in the course are as follows:

URL: http://static.nsta.org/pdfs/2020NSTAStandards.pdf

Standard 2: Content Pedagogy – Effective teachers of science understand how students learn and develop scientific knowledge. Preservice teachers use scientific inquiry to develop this knowledge for all students.

Standard 3: Learning Environments – Effective teachers of science are able to plan for engaging all students in science learning by setting appropriate goals that are consistent with knowledge of how students learn science and are aligned with state and national standards. The plans reflect the nature and social context of science, inquiry, and appropriate safety considerations. Candidates design and select learning activities, instructional settings, and resources--including science-specific technology, to achieve those goals; and they plan fair and equitable assessment strategies to evaluate if the learning goals are met.

Standard 5: Impact on Student Learning – Effective teachers of science provide evidence to show that P-12 students' understanding of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Candidates provide evidence for the diversity of students they teach.

Standard 6: Professional Knowledge and Skills – Effective teachers of science strive continuously to improve their knowledge and understanding of the ever-changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community.

NCTM Standards

The National Council of Teachers of Mathematics (NCTM, 2012) Standards for Initial Preparation of Mathematics Teachers addressed in the course are as follows: URL: https://www.nctm.org/Standards-and-Positions/CAEP-Standards/

Standard 3: Content Pedagogy – Effective teachers of secondary mathematics analyze and consider research in planning for and leading students in rich mathematical learning experiences.

Standard 4: Mathematical Learning Environment – Effective teachers of secondary mathematics exhibit knowledge of adolescent learning, development, and behavior.

Standard 5: Impact on Student Learning – Effective teachers of secondary mathematics provide evidence demonstrating that as a result of their instruction, secondary students' conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and application of major mathematics concepts in varied contexts have increased.

Standard 6: Professional Knowledge and Skills – Effective teachers of secondary mathematics are lifelong learners and recognize that learning is often collaborative.

Technical Assistance

Part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UNT Help Desk: UNT Student Help Desk site (http://www.unt.edu/helpdesk/index.htm)
Email: helpdesk@unt.edu

Phone: 940-565-2324 **In Person**: Sage Hall Sage Hall, Room 330 **Walk-In Availability**: 8am-5pm

For additional support, visit Canvas Technical Help (https://community.canvaslms.com/docs/DOC-10554-4212710328)

How to Succeed in this Course

Use Your ADA Accommodations

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation.

Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the Office of Disability Access website (http://www.unt.edu/oda). You may also contact ODA by phone at (940) 565-4323.
Students can connect with the Office of Disability Access to begin the registering process (https://studentaffairs.unt.edu/office-disability-access). This should be done once each semester.

Communication practices

You are not alone in this course; I'm here to help navigate you to success. Please communicate ALL your concerns or questions to me. It helps me make better decisions on how to support your learning journey. "I can't help you if I don't know you need help"

How can I reach you outside of class? UNT email is the most efficient medium of communication, when we're not face-to-face. You may also message me through Canvas. Canvas forwards all messages to our UNT emails; however, your comments on Canvas will NOT be forwarded. If you have time-sensitive information, please email me. Also, though email is the most efficient, I prefer that we make arrangements to meet whenever possible.

How long does it take you to respond to my emails? You can expect to receive a response to your emails (during the weekdays) within 24 hours. Emails sent over the weekends (i.e. Friday afternoon to Sunday) can expect a response as early as Sunday evening or Monday morning. If your email requires a response and you don't receive one within 48 hours, please don't be afraid to send me a follow-up email. The semester can get pretty busy, and my inbox becomes rather full. A gentle nudge is appreciated.

Proactive communication with me is critical and it is also an essential component of being an effective teacher. If you are struggling or having difficulties, please reach out to me as soon as possible so that we can get them resolved.

Supporting Your Success and Creating an Inclusive Learning Environment

I value the many perspectives students bring to our campus. Please work with me to create a classroom culture of open communication, mutual respect, and inclusion. All discussions should be respectful and civil. Although disagreements and debates are encouraged, personal attacks are unacceptable. Together, we can ensure a safe and welcoming classroom for all. If you ever feel like this is not the case, please stop by my office and let me know. We are all learning together.

Course Schedule

This calendar is tentative and subject to change based on the needs of students & instructor.

Week #	Topic	Day	Readings due, See Canvas for Assignments
Week 1	**The Culturally Responsive Educator**	Tues (8/19)	In class: Introductions, Identity document, Class norms & grading discussion
		Thurs (8/21)	Read Before Class: Redefining Grades In Class: Finalize discussion of grading and class norms, Fish is Fish video – In Class An Indian Father's Plea (Lake)
Week 2		Tues (8/26)	Read Before Class: HPL II Ch 2 Context and Culture Introduce Classroom Culture Interview Assignment
		Thurs (8/28)	Read Before Class: Hammond CRT & Brain Chap 1 & 2
Week 3		Tues (9/2)	Read Before Class: Hammond CRT & Brain Chap 3
		Thurs (9/4)	Read Before Class: Gardner Chap 7 – Recent Perspectives [side trip into the brain]
Week 4		Tues (9/9)	Theories of Learning & the Brain [side trip into the brain] Read Before Class: Worksheets don't grow dendrites intro
		Thurs (9/11)	Read Before Class: Hammond CRT & Brain Chap 4 & 5
Week 5		Tues (9/16)	Read Before Class: Hammond CRT & Brain Chap 6
		Thurs (9/18)	Read Before Class: Hammond CRT & Brain Chap 7
Week 6		Tues (9/23)	Read Before Class: Hammond CRT & Brain Chap 8
		Thurs (9/25)	Read Before Class: Hammond CRT & Brain Chap 9 to end In Class – Mursion Orientation Classroom Culture Interview Assignment Due Sunday (9/28) 11:59 pm
Week 7	**The Ethical Educator**	Tues (9/30)	MCEE introduced Ethics in Education Paper assigned
		Thurs (10/2)	Case Discussions Mursion Session Reflection assigned
Week 8		Tues (10/7)	Workday – Complete State Regulated Trainings & Mursion Session
		Thurs (10/9)	Workday – Complete State Regulated Trainings & Mursion Session
Week 9		Tues (10/14)	Examining UNT COE Professional Dispositions Read Before Class: Berry et al: Critical History of Math Ed OR Cuban et al: Integration of modern sciences (content specific)
		Thurs (10/16)	Read Before Class: Sternberg (2007) Who are the Bright Children Mursion Session Reflection Due Sunday (10/19) 11:59 pm
Week 10	**The Knowledgeable Educator**	Tues (10/21)	Discuss CRT and Designing learning environments
		Thurs (10/23)	Read Before Class: Gardner Chap2: Origins of scientific perspective Ethics in Education Paper Due Sunday (10/26) 11:59 pm

Week #	Topic	Day	Readings due, See Canvas for Assignments
Week 11	**The Knowledgeable Educator**	Tues (10/28)	Read Before Class: HPL I: Ch 3 Learning and Transfer Designing a Learning Environment Project assigned
		Thurs (10/30)	Read Before Class: HPL II: Ch 6 Motivation to Learn
Week 12		Tues (11/4)	Read Before Class: HPL II Ch 7 Implications for learning in school
		Thurs (11/6)	Read Before Class: Horn (2012) Strength in Numbers Ch 1 & Ch 2
Week 13		Tues (11/11)	Read Before Class: Math: Developing Mathematics Identity OR Science: From Interest to Identity (read the appropriate article for your content)
		Thurs (11/13)	Read Before Class: Developing your identity as a new teacher Teaching Philosophy Paper assigned
Week 14	**The Highly Effective Educator**	Tues (11/18)	Read Before Class: The ABCs – F is for feedback
		Thurs (11/20)	Read Before Class: The ABCs – L is for listening
Thanksgiving Break – No Classes			
Week 15	**The Highly Effective Educator**	Tues (12/2)	Prep Day & Grade Discussions with Instructor
		Thurs (12/4)	Final Questions, & Grade Discussions with Instructor Designing a Learning Environment Project Due Sunday (12/7) @11:59 pm***
Week 16	**Final Exam** - Tuesday December 9th 10:30 -12:30 pm Teaching Philosophy Paper Due***		

Grading

Course content will focus on learning theories; as a result, emphasis will be placed on the preservice teachers' learning. Qualitative feedback will be given for course readings and assignments. Every preservice teacher will be issued a final grade based on the criteria below, but individual assignments will not be evaluated quantitatively. The final grade will be determined through a collaborative discussion between the preservice teacher and instructor.

Course grades will be determined based on your performance in the following categories:

- Daily Reading Assessments & Class Discussion and Presentation
- State Regulated Trainings
- Mursion Session Reflection
- Ethics in Education Paper
- Classroom Culture Interview Assignment
- Designing a Learning Environment Project
- Teaching Philosophy Paper

Furthermore, the purpose of feedback will not be to evaluate the preservice teacher's work. Instead, feedback will come in the form of questions and comments designed to continue the individual's learning process. If this process causes undue stress, please communicate this with the course instructor. If you are unsure of your academic standing at any point in the semester, the best path forward is to complete course readings, **engage in conversation**, and complete course assignments.

A	● Demonstrates high level of understanding of concepts/mastery of skills on benchmark assignments ● Exhibits novel, insightful, and/or creative ways to show learning ● Meets all learning deadlines fully and consistently ● Shows frequent evidence of growth, turning weaknesses to strengths ● Attends class sessions as outlined in the course calendar with **no more or equal to than 3 unexcused absences** over the semester.
B	● Demonstrates a good grasp of concepts and skills on benchmark assignments ● Exhibits a combination of standard and novel/insightful/creative ways to show learning ● Meets most learning deadlines fully and consistently ● Shows some evidence of growth ● Attends most class sessions (**no more than 4 unexcused absences**) as outlined in the course calendar
C	● Demonstrates a satisfactory acquisition of concepts and skills on benchmark assignments. ● Exhibits standard ways to show learning. ● Meets some required learning deadlines. ● Shows little evidence of growth ● Attends some class sessions (**5 unexcused absences**) as outlined in the course calendar
F	● More than 5 absences throughout the semester ● Failure to communicate with course instructor on paths to improvement ● Failure to complete course assignments (ex. Readings, benchmark assignments)
Incomplete	To be determined and discussed by course instructor and individual student as necessary.

While students will make grade declarations and progress updates throughout the semester, it is ultimately the course instructor's discretion as to what grade students receive in the end.

Assignments

1. **Participation, Reading Questions, & Guiding Class Discussion**
   - For the readings, each week you will create a 'creative assessment' of the readings and submit it on Canvas. See Canvas for more information on this assignment.
2. **Ethics in Education Paper**
   - This paper's focus is on historical and / or current ethics of mathematics or science teaching and learning. Possible topics may include, but are not limited to, the effects of segregation on mathematics or science classrooms, the mathematics or science as gatekeeper for access to higher education or engaging in ethical conversations in the mathematics or science classroom.
3. **Classroom Culture Interview Assignment**
   - This assignment will require you to interview two individuals. Individual One is a student from a very different cultural background than your own. Individual Two is a secondary teacher** that you have some experience with, in your content area. Each of the two interviews will focus on slightly different aspects of culture. Please see the assignment on Canvas for sample questions with which to launch the interviews.
   - The two interviews may be done in person or over Zoom and should last approximately 15 - 20 minutes. Each interview must have at least 10 minutes of transcription included as an appendix (minimum of 20

minutes total). The transcriptions are used to support the arguments and statements you make in the paper. It is highly recommended you use software which will automatically transcribe your interview (within a reasonable margin of error).
- After the interviews are completed, you will write a paper that compares the different experiences of Individual One with your own, and how the teacher, Individual Two, constructed the classroom culture to help classroom learning of the content. The paper must use APA formatting, along with citations for the relevant academic literature explaining why you chose the activity.

4. **Mursion Session Reflection**
   - This assignment requires you to reflect on your experience in Mursion via review of session video. The goal of the session is to introduce a classroom norm and have 1 positive interaction with each student during a "which one doesn't belong" activity & discussion. Further details and assignment document will be provided on canvas.
5. **Designing a Learning Environment Project**
   - What will a learning environment look like in your future classroom? What are the classroom rules? What will the physical room look like? What are the objectives of the classroom, and are they reflected in the layout of the room? These questions and more will be explored through an analysis and synthesis of the readings, scientific or mathematical objectives of a possible lesson, and an understanding of the possible learners. The goal of this lesson is to allow you to have a strong understanding of the decisions that go into designing the classroom learning environment. The learning environment you design must incorporate what was learned in readings on Culturally Responsive Teaching and educational ethics.
6. **Teaching Philosophy Paper**
   - The final paper will be a reflective essay based upon the entire semester's readings and discussion. Within the context of the courses you take in the Teach North Texas program, you should be continually thinking about your own teaching philosophy. As you are exposed to new ideas and experiences, your philosophy will more than likely change. One of the artifacts required in the Knowing and Learning course is teaching philosophy statement. Keep in mind that you only have one chance to make a good first impression with prospective employers. Therefore, your philosophy statement should be well organized and clearly written.

Attendance and Participation

You are preparing for a profession in which your daily presence is imperative to the success of your students and your attendance in this class represents that commitment. This course is designed and organized to be highly collaborative. Therefore, your attendance and participation are essential to your learning. It is not possible to be enriched by discussions and collaborations if you are not present or prepared for class.

What is the tardies & attendance policy? Your presence is welcomed and expected for every class session. Attendance is taken every day. Life happens. If you cannot attend class **for any reason, including for the observance of a religious holy day**, please:

1. Contact Ms. Joykutty at Nancy.Joykutty@unt.edu **before** class.
2. Use your resources to access all announcements, assignments and information presented or discussed in class, amid your absence. (Keep in mind that illness-related absences may require a doctor's note.)

Whether poor or late attendance, not attending for the full class time will adversely affect your grade for this course. Students missing more than 10 minutes of a class will be counted as absent. Below is the attendance policy.

- 3 tardies = 1 absence. This means arriving to class late *and/or* leaving class early.
- 3 absences = final grade in the course will be lowered by one full letter grade.
- 4 absences = final grade in the course will be lowered by two full letter grades.
- 5 absences = F in the course

What is the participation policy? Your participation in class is required. The content taught is best learned by doing and discussion. Participating in class enhances student learning and growth. A reduction in the Professionalism portion of the final grade occurs when you do not actively and responsibly participate in the course.

Educator Professionalism Policy (Teach North Texas)

All students are expected to meet educator professionalism standards in all verbal and written communication. Standards may be found in the Educators' Code of Ethics within the Texas Administrative Code at the following link: https://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=4&ti=19&pt=7&ch=247&rl=Y

Syllabus Change Policy

This course syllabus is intended to be a guide and may be amended at any time by the instructor.

Department of Teacher Education and Administration: Preparing Tomorrow's Educators and Scholars

The **Department of Teacher Education and Administration** seeks to improve educational practice through the generation of knowledge and to prepare education professionals who serve all students in an effective, inclusive and equitable manner. Its focus is on the preparation of highly competent educators, researchers and administrators who employ current theory and research as they fill these important roles.

Mission

The Department of Teacher Education and Administration integrates theory, research, and practice to generate knowledge and to develop educational leaders who advance the potential of all learners.

Vision

We aspire to be internationally recognized for developing visionary educators who provide leadership, promote social justice, and effectively educate all learners.

UNT POLICIES

Eagle Alert

Students will be notified by Eagle Alert if there is a campus closing that will impact a class and describe that the calendar is subject to change, citing the Emergency Notifications and Procedures Policy (PDF)

Academic Integrity Policy

Every student in my class can improve by doing their own work and trying their hardest with access to appropriate resources. For example, students who use other people's work without citations will be violating UNT's Academic Integrity Policy. Please read and follow this important set of guidelines for your academic success (https://policy.unt.edu/policy/06-003).

Academic dishonesty breaches the mutual trust necessary in an academic environment and undermines all scholarship. Our standard for academic integrity is a preponderance of evidence, a standard of review in the student appeal process that evaluates whether allegations are more likely to be true than not true. Consequences may include but not limited to, no credit for an assignment, lower course grade, course failure, etc. Violations will be filed with the Academic Integrity Office.

Other UNT Policies

The official UNT policies for the following are contained in this link, Student Support Services & Policies. You will be help responsible for these policies and procedures and well, so please take the time to review them as well.

- Prohibition of Discrimination, Harassment, and Retaliation
- Academic Integrity Policy – Full Description of the policy
- ADA policy
- Retention of Student records

- Course safety procedures (for Laboratory Courses) – This course does not contain a lab, but you should familiarize yourself with this policy as it will apply to your science courses.

The following topics, policies, and procedures are also contained in this link:

- Student Expectations and Preferences
- Student Wellness and Academic Records
- Communication